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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,350	07/29/2003	Masanori Fukui	238236US-2X	4502
22850	7590	07/13/2009		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
DEHGHAN, QUEENIE S				
ART UNIT		PAPER NUMBER		
1791				
NOTIFICATION DATE		DELIVERY MODE		
07/13/2009		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/628,350

Applicant(s)

FUKUI ET AL.

Examiner

QUEENIE DEHGHAN

Art Unit

1791

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/5/09.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15, 18 and 19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15, 18 and 19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/CIS-100)
Paper No(s)/Mail Date 6/5/9 3/18/09 1/21/09
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 19, 2009 has been entered.

Terminal Disclaimer

2. The terminal disclaimer filed on June 5, 2009 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent No. 6,853,673 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-3, 5, 7-8, 10, 12-13, 15, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667), Sato (JP 56-31188), Richards (5,364,426), Koontz (3,997,316), and Machlan (3,806,621). Honma et al. disclose a process for producing a quartz glass crucible for pulling up a single crystal silicon comprising forming a body 14 having a crucible shape, arc melting the formed body while rotating to obtain a quartz crucible, mechanically grinding the inner surface of the crucible and then remelting the inner surface by arc melting so as to reform the surface and eliminate residual air bubbles. Honma et al. fail to disclose specifics of the arc discharging electrodes used.

Chenoweth teach the use of several electrodes positioned around a rotational axis, in which the neighboring electrodes are positioned at regular intervals from each other in a ring-like configuration forming a stable ring-like arc between the neighboring electrodes and without generating a continuous arc between electrodes facing each other across a central portion of the ring-like configuration (Figure 1A col. 4 lines 45-48). Furthermore, Chenoweth teach positioning the electrodes so to have an absolute value of a phase difference of 120° (see path of heating current connect three electrodes (360° divide by $3 = 120^\circ$, Figure 3, col. 6 lines 54-57) and forming a circle with a radius that is at least $\frac{1}{4}$ of the radius of an open portion of the crucible (col. 4 lines 48-50, col. 7 lines 23-25). It

would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the electrode arrangement of Chenoweth in the process of Honma et al. in order to control a high temperature arc discharge to a large diameter crucible for even heating.

4. Regarding the electrode structure, Honma does not specifically recite an electrode structure with $3n$ electrodes with 3 phase AC, $2n$ electrodes with 2 phase AC, or 8 electrodes with 4 phase AC. Chenoweth teaches using more or less electrodes in other configurations (col. 9 lines 19-20) and that other electrode configurations is an result effective variable that one skill in the art could arrive at by routine experimentations (col. 10 lines 15-21). Sato teaches creating ring like arc with multiple electrodes with multi-phase alternating current power source. Furthermore, creating a ring like arc with $3n$ electrodes and 3 phase AC ($n \geq 2$) or with $2n$ electrodes and 2 phase AC or 8 electrodes and 4 phase AC are common in the art. For example, Richards teaches an example for melting glass using nine electrodes in a ring-like configuration with applying 3-phase current to the electrodes (col. 13 lines 40-48). Also, Koontz teaches melting glass with eight electrodes arranged in a ring-like configuration (col. 4 lines 55-57). Koontz also mentions using different currents of differing phases to accommodate the particular number of electrodes (col. 2 lines 16-20). Also, Machlan teaches using four-phase current to four electrodes used for melting glass (col. 3 lines 62-63, col. 4 lines 6-7, 13-15). Machlan also teaches the design configuration can be adapted to 2 phase power source or other multi-phase power source (col. 7 lines 40-45). It would have been obvious to one of ordinary skill in the art at the time the

invention was made to have selected and optimized the desired number of electrodes with an appropriate multi-phase current power source, such as 3n electrodes with 3 phase AC or 2n electrode with 2 phase AC or 4 phase AC, for the heating purposes of the crucible in the method of Honma as the prior art has demonstrated that it is known to optimize these result effective variables through routine experimentation in order to achieve the predictable result of achieving the desired zone control over temperatures depending on the shape and size of the area to be heated.

5. Claim 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (JP Abstract 02-188489) in view of Chenoweth (6,044,667), Sato (JP 56-31188) and Richards (5,364,426). Watanabe et al. disclose a process for pulling up a single crystal silicon and regenerating a quartz glass crucible by grinding foreign substance on an inside surface of the crucible and fusing the inside surface of the crucible to be smoothed with an arc discharge generated by an electrode (abstract). However, Watanabe et al. does not disclose specifics of the electrode used. Chenoweth teach the use of several electrodes positioned around a rotational axis, in which the neighboring electrodes are positioned at regular intervals from each other in a ring-like configuration forming a stable ring-like arc between the neighboring electrodes (Figure 1A col. 4 lines 45-48). Furthermore, Chenoweth shows in figure 3, a ring like arc between neighboring electrodes, without generating a continuous arc between electrodes facing each other across a central portion of the ring-like configuration. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the electrode arrangement of Chenoweth in the process of Watanabe et

al. in order to control a high temperature arc discharge to a large diameter crucible for even heating.

6. Regarding the electrode structure, Watanabe does not specifically recite an electrode structure with $3n$ electrodes with 3 phase AC. Chenoweth teaches using more or less electrodes in other configurations (col. 9 lines 19-20) and that other electrode configurations is an result effective variable that one skill in the art could arrive at by routine experimentations (col. 10 lines 15-21). Sato teaches creating ring like arc with multiple electrodes with multi-phase alternating current power source. Furthermore, creating a ring like arc with $3n$ electrodes and 3 phase AC ($n \geq 2$) are common in the art. For example, Richards teaches an example for melting glass using nine electrodes in a ring-like configuration with applying 3-phase current to the electrodes (col. 13 lines 40-48). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected and optimized the desired number of electrodes with an appropriate multi-phase current power source, such as $3n$ electrodes with 3 phase AC, for the heating purposes of the crucible in the method of Watanabe as the prior art has demonstrated that it is known to optimize these result effective variables through routine experimentation in order to achieve the predictable result of achieving the desired zone control over temperatures depending on the shape and size of the area to be heated.

7. Claims 4, 6, 9, 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667), Sato (JP 56-31188), Richards (5,364,426), Koontz (3,997,316), and

Machlan (3,806,621)., as applied to claims 1, 2, 3, 8 and 13 above, and in further view of Ohama et al. (6,886,364). Honma et al. and Chenoweth do not teach a crucible having a diameter between 28 and 40 inches. Ohama et al. teach of a quartz glass crucible with a diameter of 30 inches (col. 8 line 33). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the crucible size of Ohama et al. to produce silicon single crystals at improved yields.

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (JP Abstract 02-188489) in view of Chenoweth (6,044,667) Sato (JP 56-31188), and Richards (5,364,426), as applied to claim 13 above, and in further view of Ohama et al. (6,886,364). Watanabe et al. and Chenoweth do not teach of a crucible having a diameter between 28 and 40 inches. Ohama et al. teach of a quartz glass crucible with a diameter of 30 inches (col. 8 line 33). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the crucible size of Ohama et al. to produce silicon single crystals at improved yields.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to QUEENIE DEGHAN whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Queenie Dehghan/
Examiner, Art Unit 1791